

Untangling Seasonal Predictions over California During 2015/16 El Niño and the Parable of Blind Men and an Elephant: What next?

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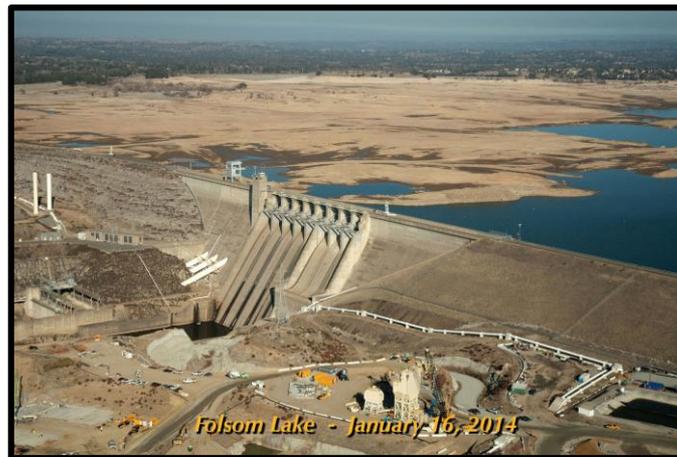
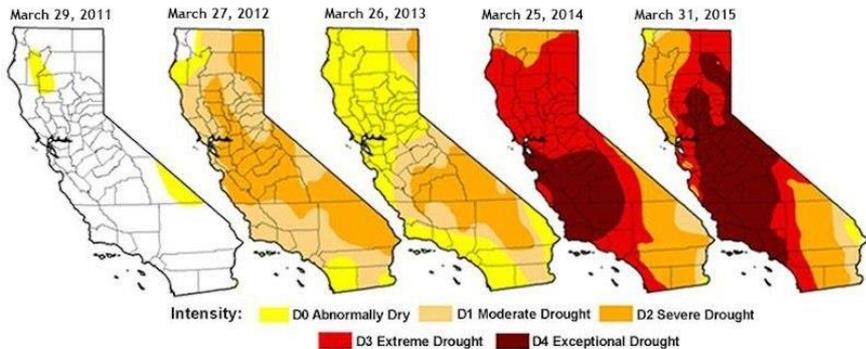
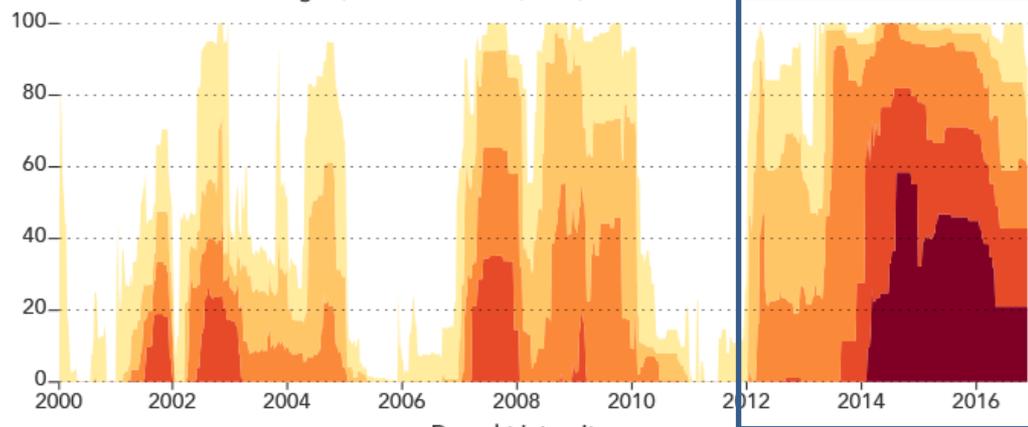
Climate Prediction Center

Outline

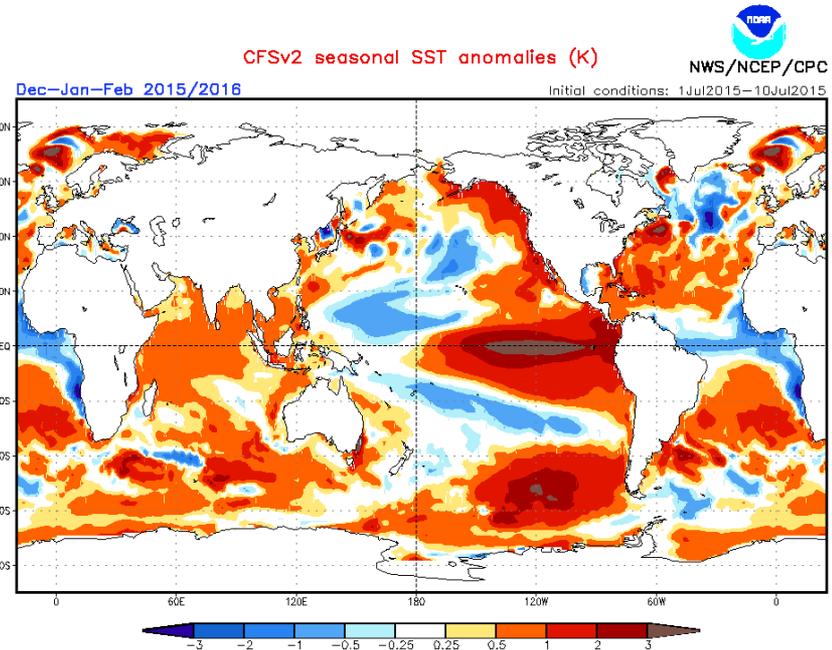
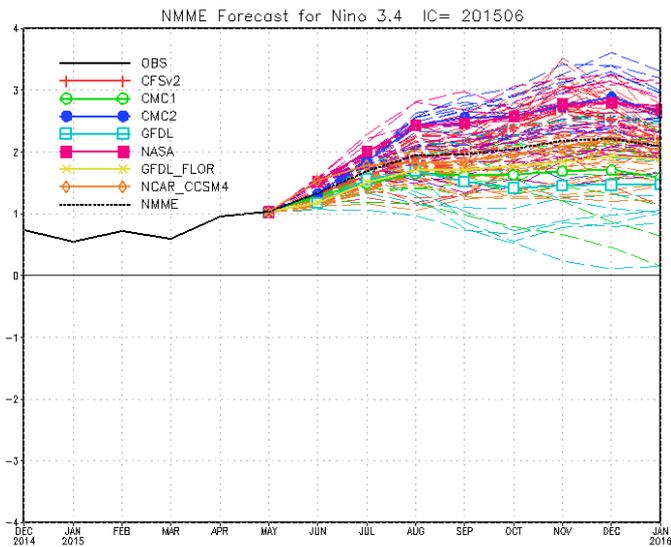
- The context: The performance of the seasonal forecast over the US west coast during winter of 2015/16.
- What are the science issues?
- What next?

The 2011-2017 California Drought

Percent of California in Drought (as of November 8, 2016)

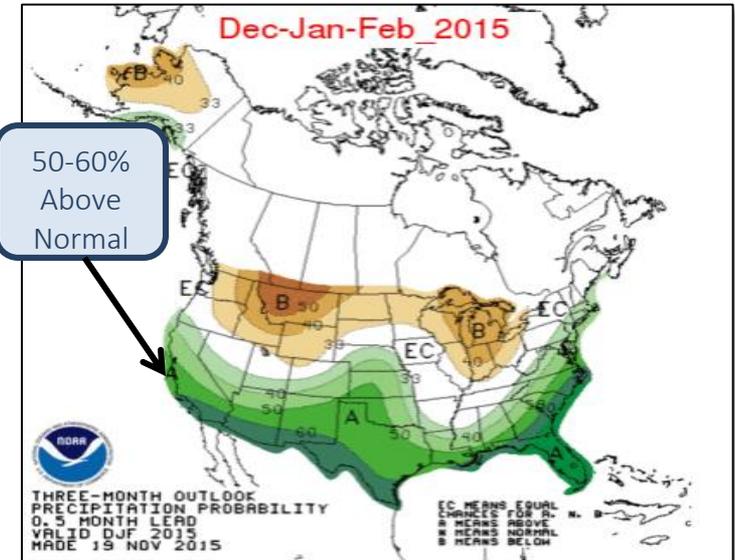
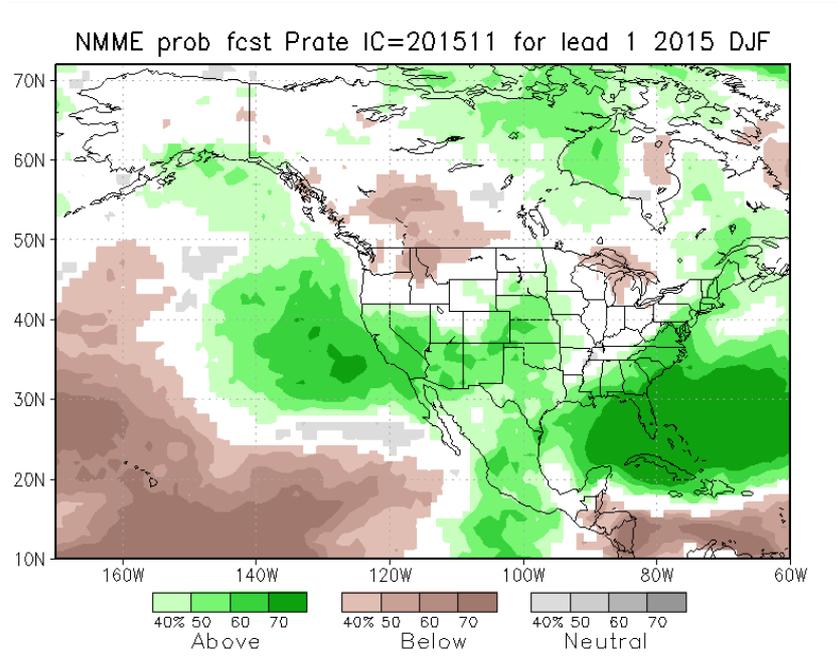


Predictions for 2015-16 El Niño (from spring/summer 2015)



Consistent indications for a strong El Niño during the winter of 2015/16

Predictions for enhanced chances for above normal rainfall...



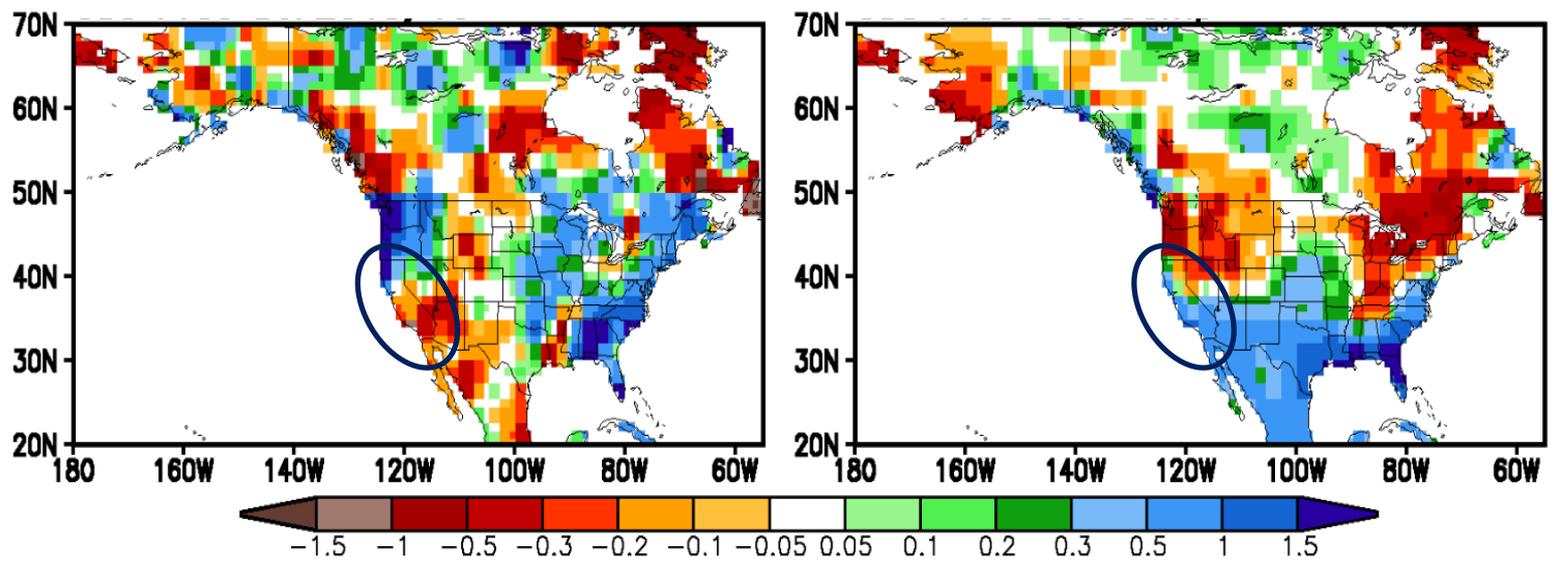
- Models and CPC forecast for DJF 2015/16 precipitation indicated above normal precipitation over California.
- Predicted pattern was consistent with canonical El Niño response.

but...



DJF 2015/16

Composite

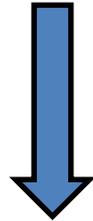


The observed rainfall anomaly and composite for El Niño

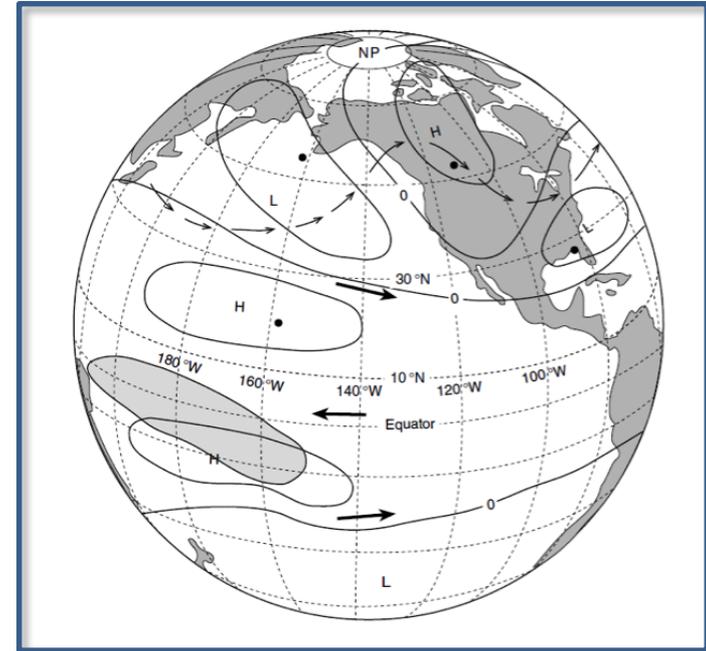
Outline

- The context: The performance of the seasonal forecast over the US west coast during winter of 2015/16.
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- Was the forecast the best it could have been?

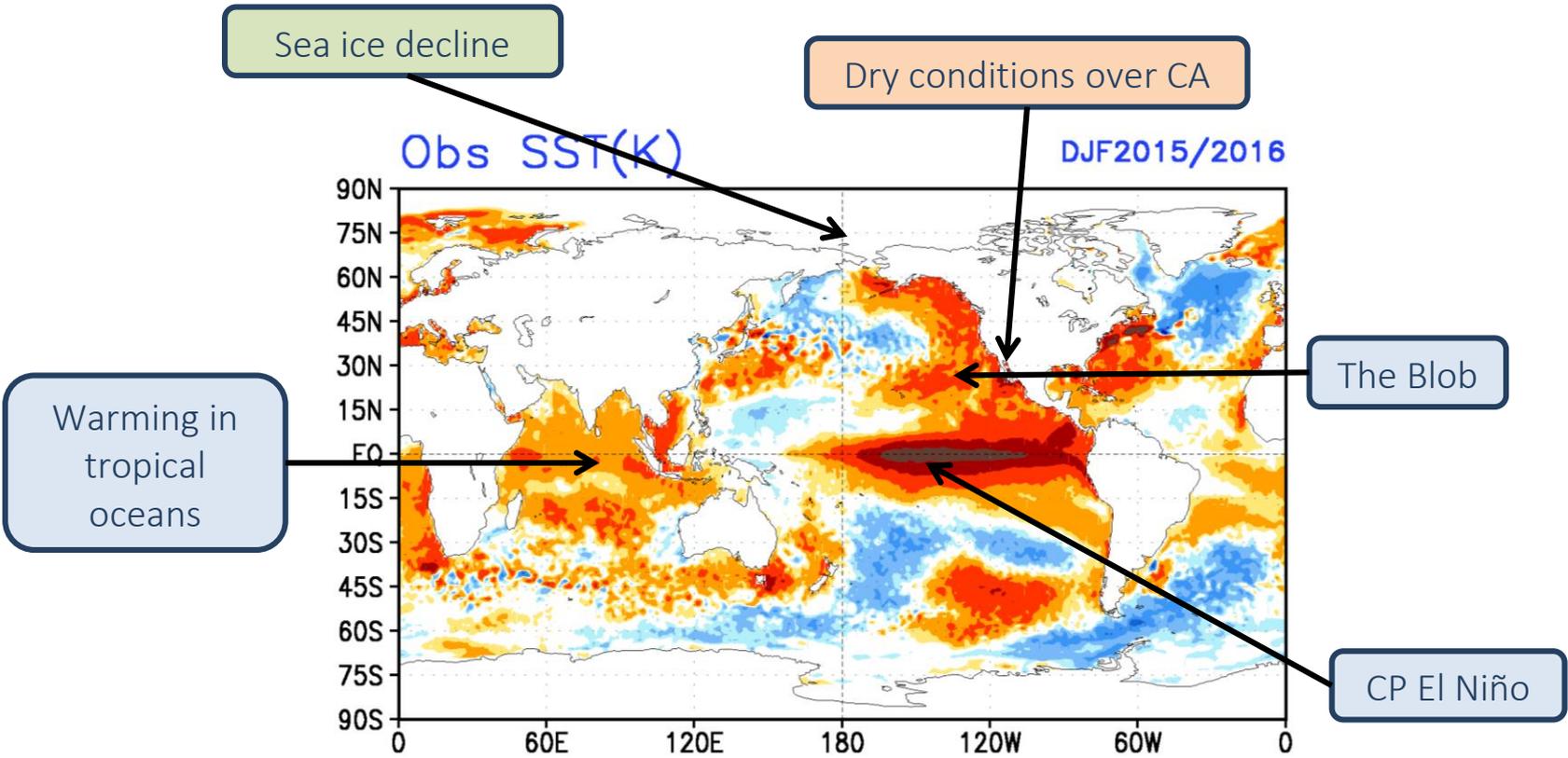


- Was the inference about the response to different boundary forcings correct?



Horel and Wallace 1981

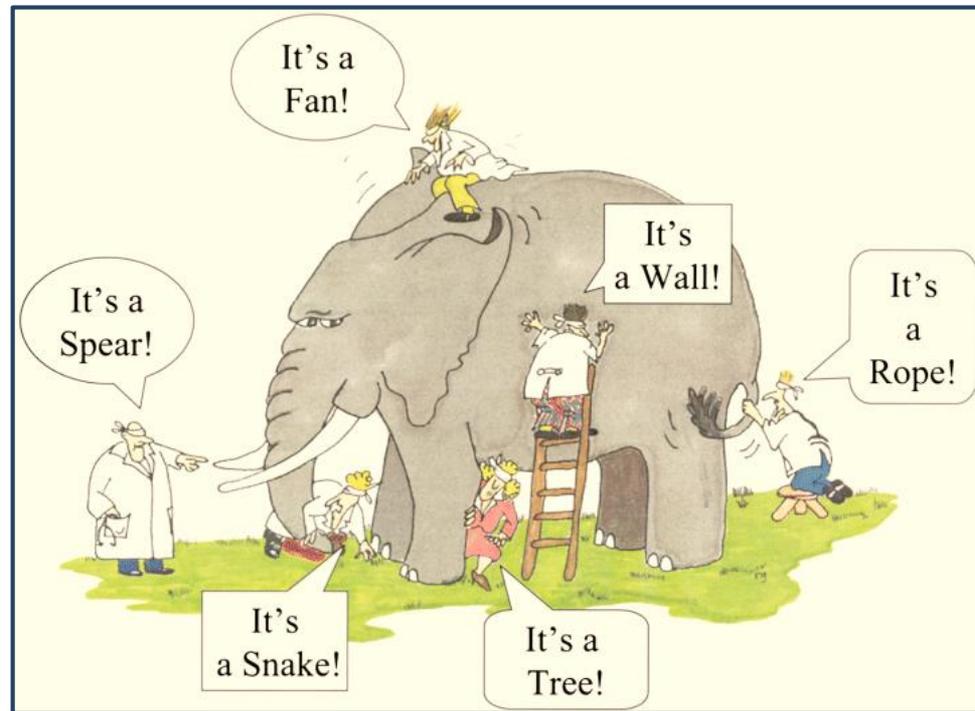
Boundary forcings



- Were the inferences about the response to different boundary forcings correct?
 - Did uniqueness of 2015/16 El Niño SSTs (ENSO flavor) alter the El Niño response?
 - Did warming of tropical SSTs alter the El Niño response?
 - Did drying over California modulated the seasonal mean response?
 - Did decline in sea ice influence the wintertime anomalies?
- Were the boundary conditions themselves well predicted?
- How could model biases have influenced conclusions about the El Niño response?

Attribution attempts for DJF 2015/16 CA rainfall

- ~ 15 papers in literature so far. Causes for discrepancy between observations and forecast attributed to
 - Decline in sea ice;
 - Atmospheric internal variability (e.g., on sub-seasonal time-scale);
 - Flavors of El Niño (i.e., dominance of warm anomalies in central Pacific);
 - Errors in the predictions of SSTs in NMME forecast;
 - Dry land conditions over California.
- The diverse range of possibilities and conclusions is, at best, baffling.



- Even for one of the largest El Niño events on record, we are unable to reach a consensus on some very basic questions.
- Historical context of understanding global influence of ENSO SSTs is 35+ years long.
- Ensemble of model simulations (AMIP) came along in 1995; 20+ years.
- And yet...

Outline

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- Some of the fundamental questions:
 - How linear is the ENSO response?
 - How much do ENSO flavors matter?
 - How does the spread of the seasonal mean change under the influence of ENSO SSTs?
 - If the spread is large and SNR is small, how to manage expectations?
 - Adverse role of model biases and resolution on inferring the response?
- How to provide answers or reach some consensus?

A thought on “what next?”

- Observational data; but data record is not enough.
- Rely on models, and to be able to do that
 - Need to establish metrics to assess if models are good enough to address the questions we have.
 - Need to establish what really matters. Not everything can be important. Scale analysis (Taylor’s expansion) is one of the basic tenets of making scientific advances.

A thought on “what next?”

- Rely on models, and to be able to do that
 - Periodic coordinated multimodal assessment of ENSO responses to a set of forcings;
 - The approach would be a combination of what was done under the US CLIVAR Drought Working Group + periodic CMIP assessment. effort.

1 OCTOBER 2009 SCHUBERT ET AL. 5251

SPECIAL
U.S. CLIVAR Drought
COLLECTION

A U.S. CLIVAR Project to Assess and Compare the Responses of Global Climate Models to Drought-Related SST Forcing Patterns: Overview and Results

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Thanks

